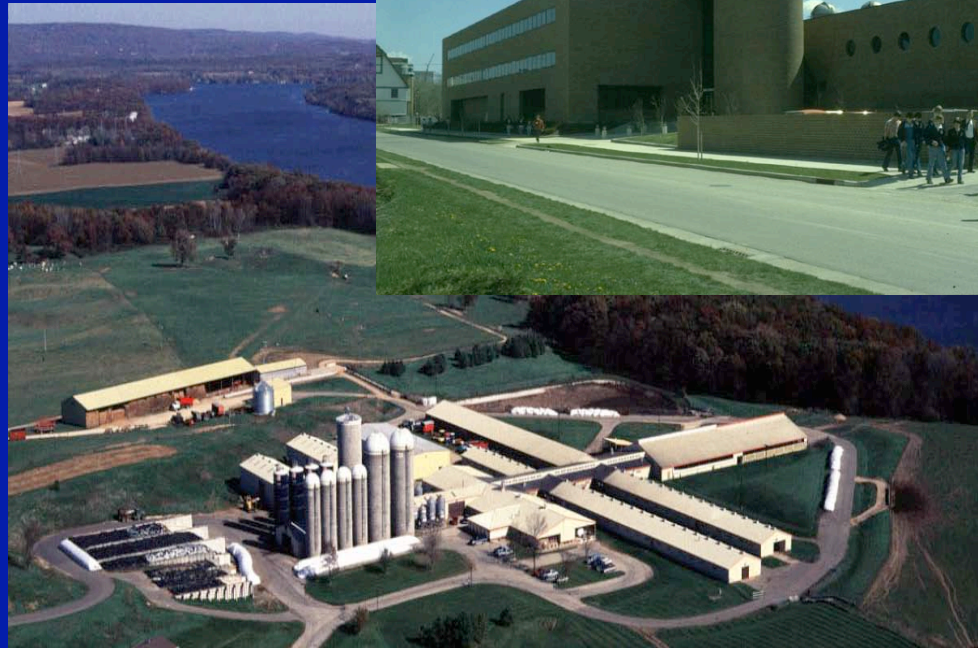


# **Maceration of Alfalfa: A Way to Improve Feed Use and Profitability of Dairy Farms?**



John Grabber and Alan Rotz

USDA-Agricultural Research Service

U.S. Dairy Forage Research  
Center, Madison, Wisconsin

Pasture Systems and Watershed  
Management Research Lab, University  
Park, Pennsylvania

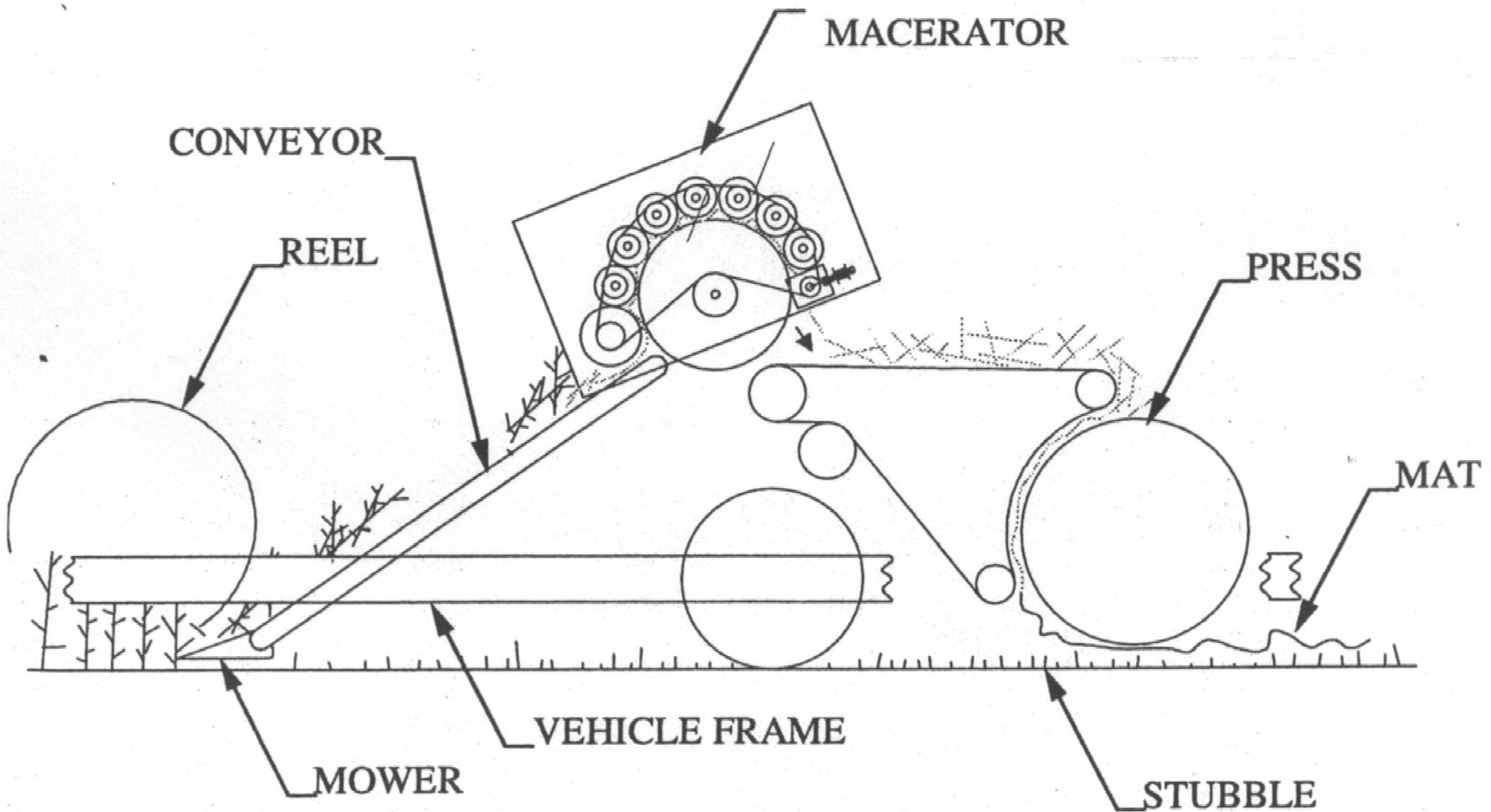


**What do you  
mean by  
maceration?**

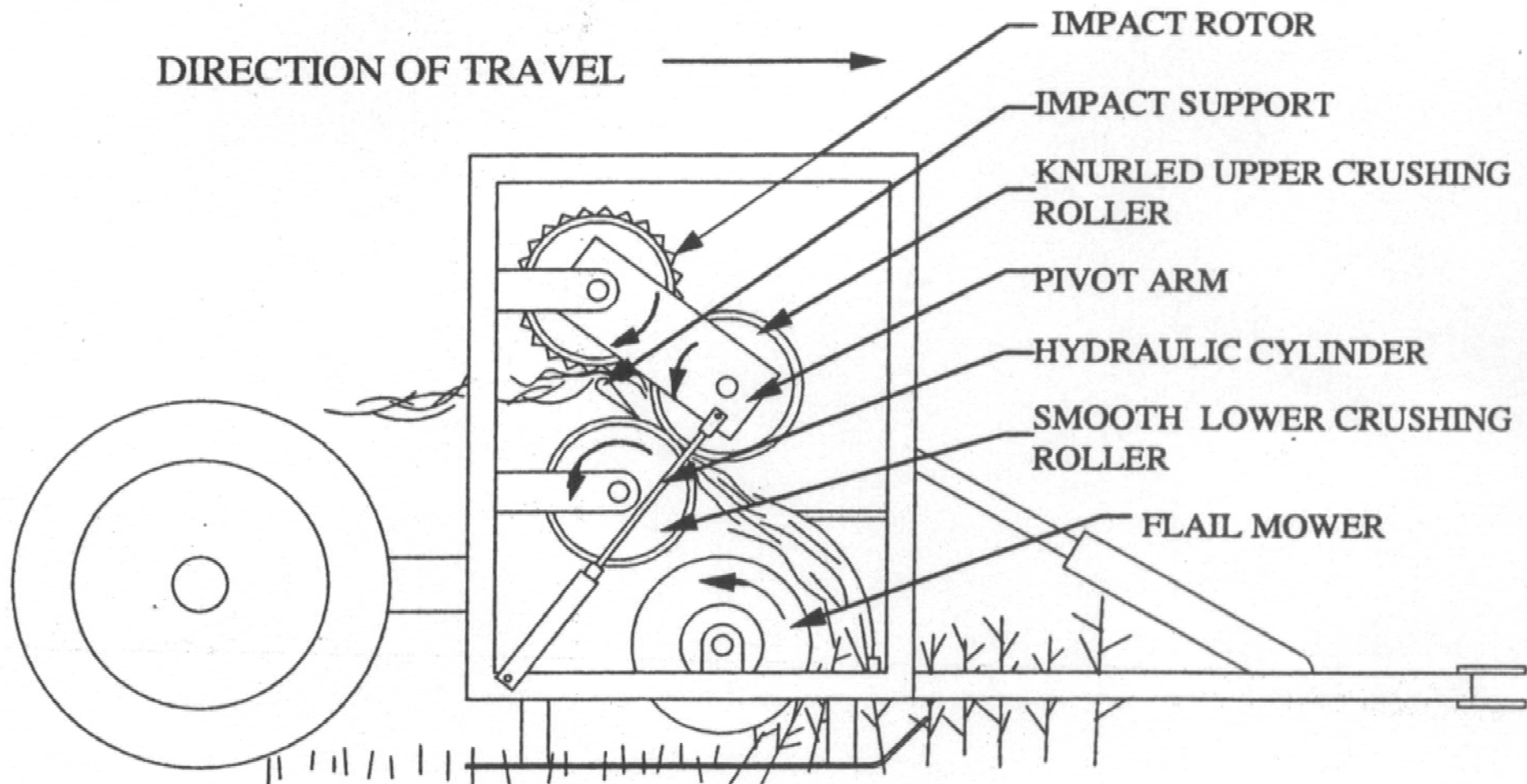




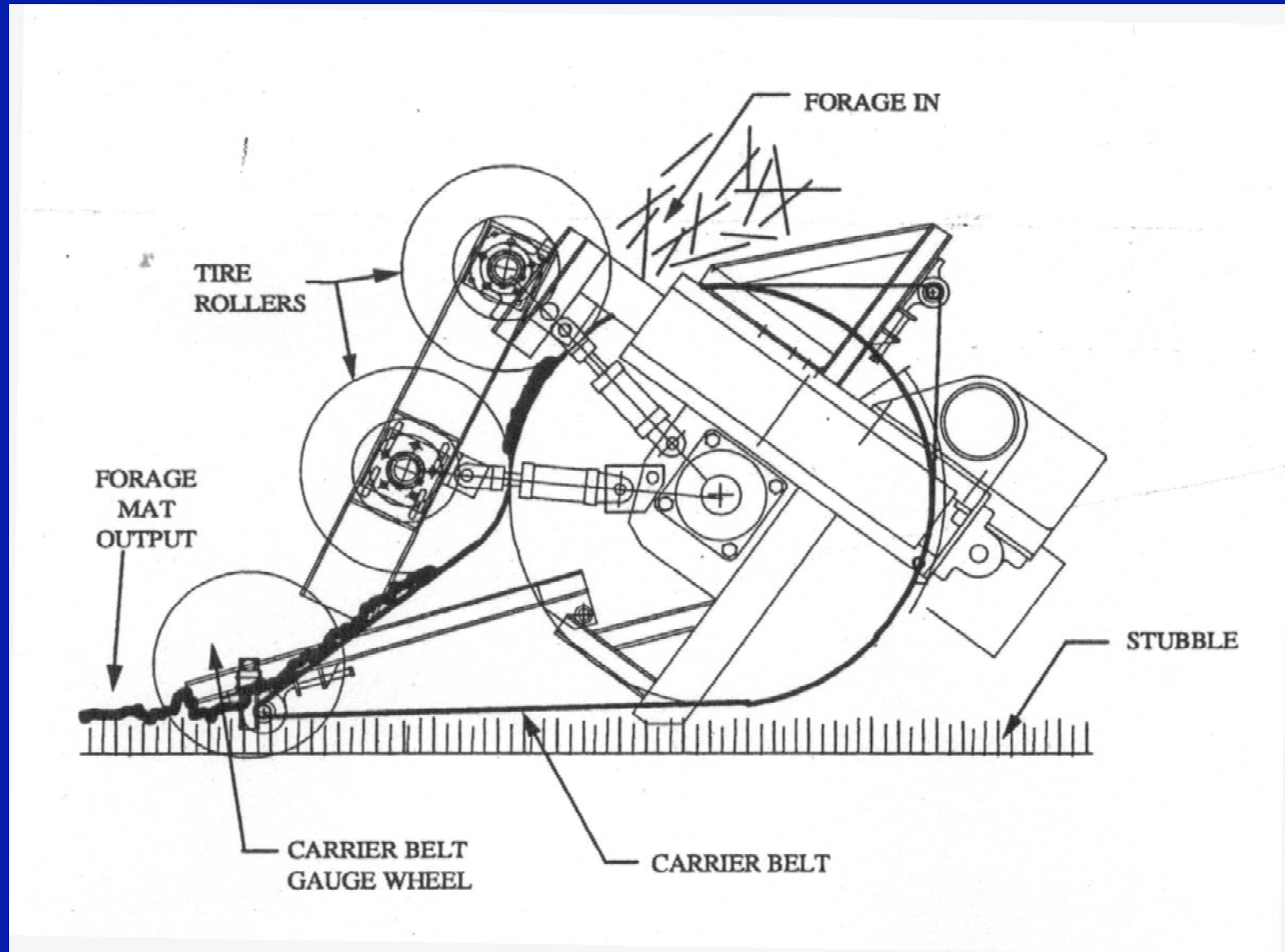
# Macerator types: Roughened roll



# Macerator types: Crushing impact



# Press for forming macerated mats

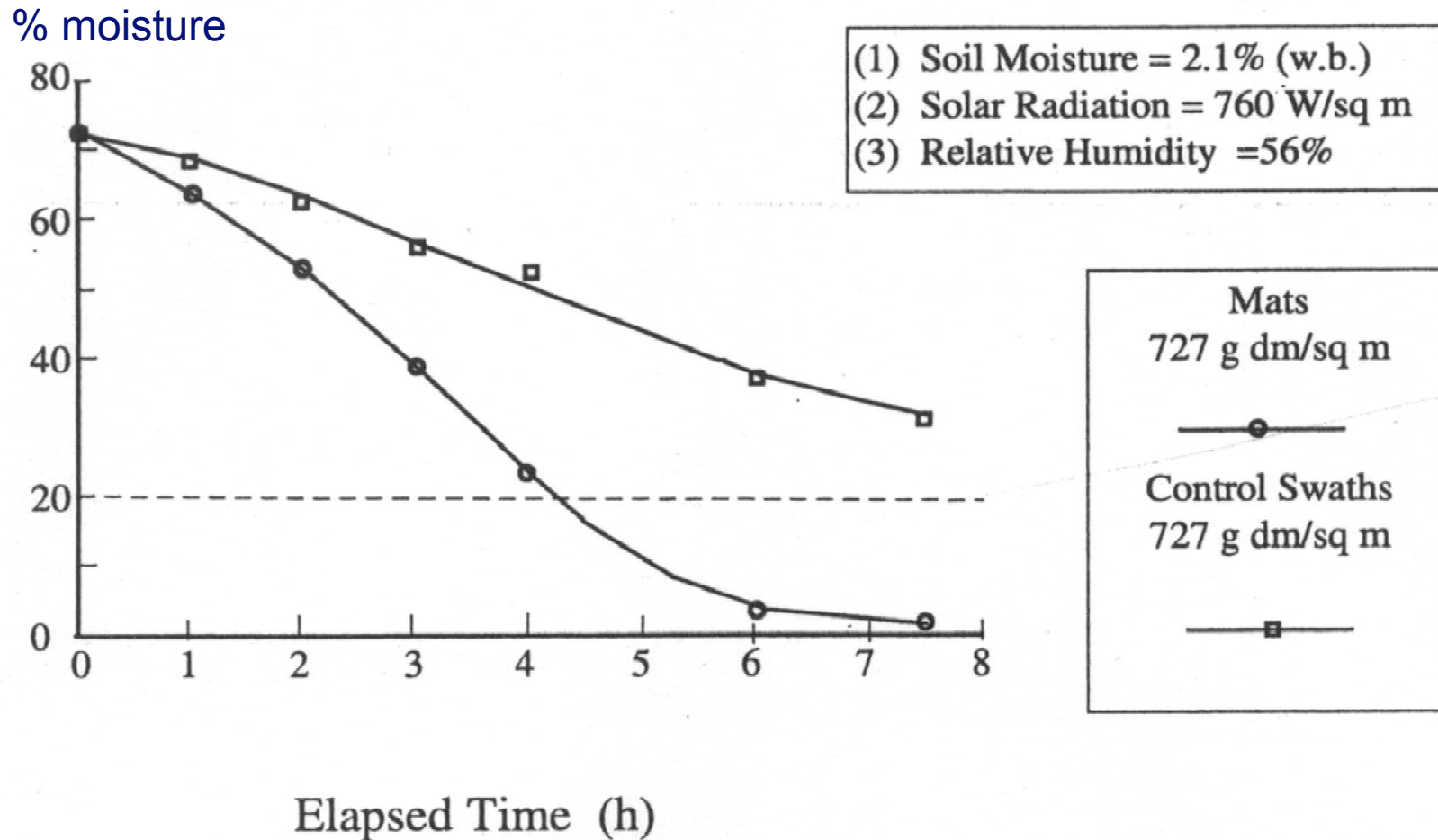




# Dairy Forage-UW macerator studies



# Maceration speeds drying of alfalfa



Shinners et al., 1988



# **Maceration increases packing density of bales or silage >20%**

**Shinners et al., 1988  
Straub et al., 1989**



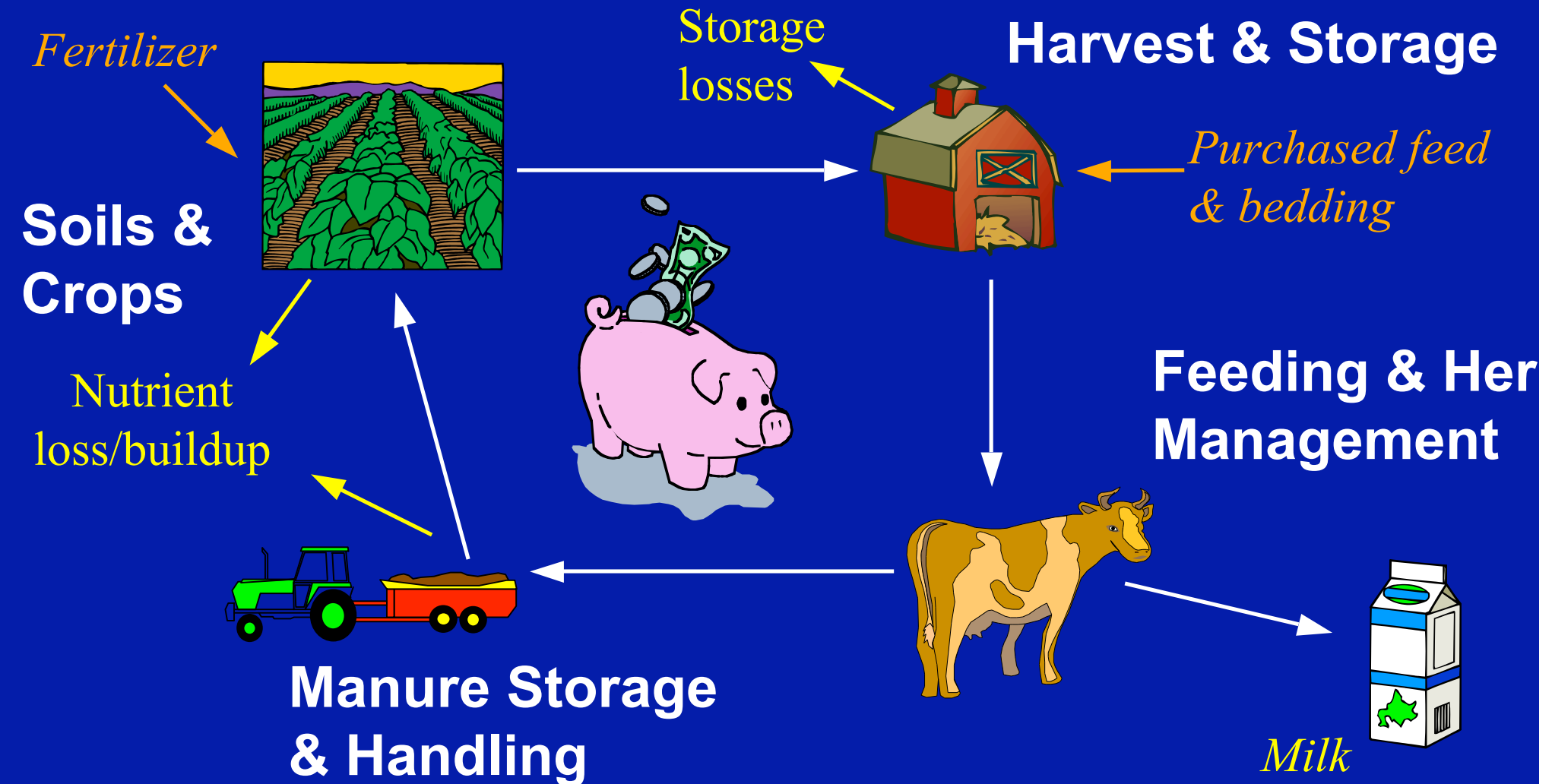


# **Holstein lactation trials: Macerated vs conditioned alfalfa (>60%) diets**

- Net energy of lactation of alfalfa increased 5-12% by maceration
- Feed intake not influenced by maceration
- Milk production increased 0 – 5.7 lb/day by maceration
- Milk fat test depressed ~0.2 percentage points by maceration
- Milk protein and nonfat solids unchanged or slightly higher with maceration
- Cows gain more weight on macerated alfalfa

Mertens et al., 1990; Mertens et al., 1996; Broderick et al., 1999

## A stylized illustration of a computer workstation. It features a CRT monitor with a green screen, a keyboard, and a mouse. To the left of the monitor is a small cup filled with various writing instruments like pens and pencils. The entire setup is set against a blue background with a yellow circular glow behind the monitor.





# Farm description

- 250 cows, 190 heifers
- 500 acres of medium silt loam soil in south central Wisconsin
- 200 acres alfalfa grown for hay or silage
- 300 acres corn grown for silage and grain
- Forages stored in bunker silos
- Manure shallow injected spring and fall with low ammonia loss (20%)



# Herd feeding & management

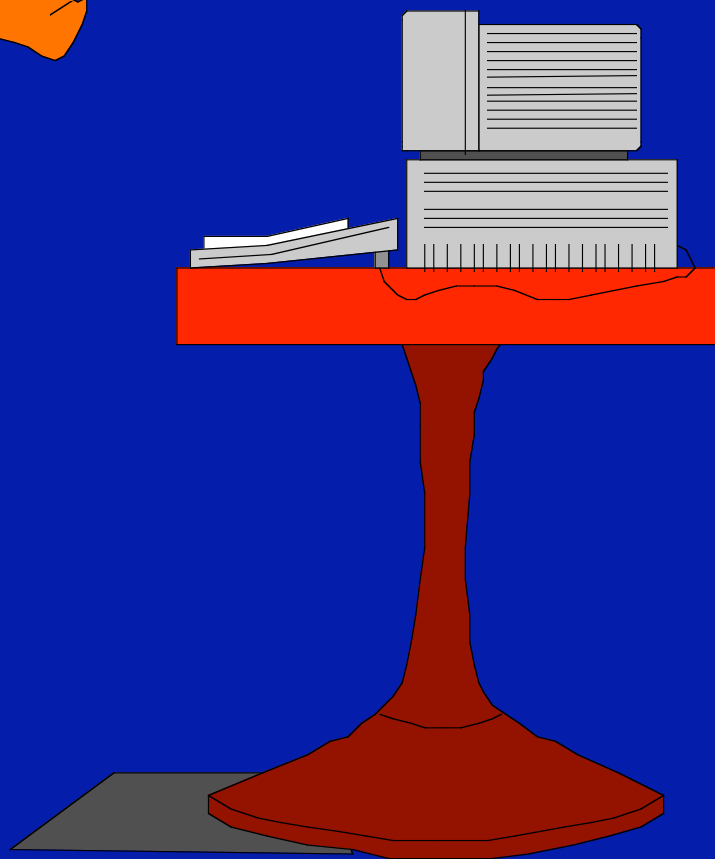
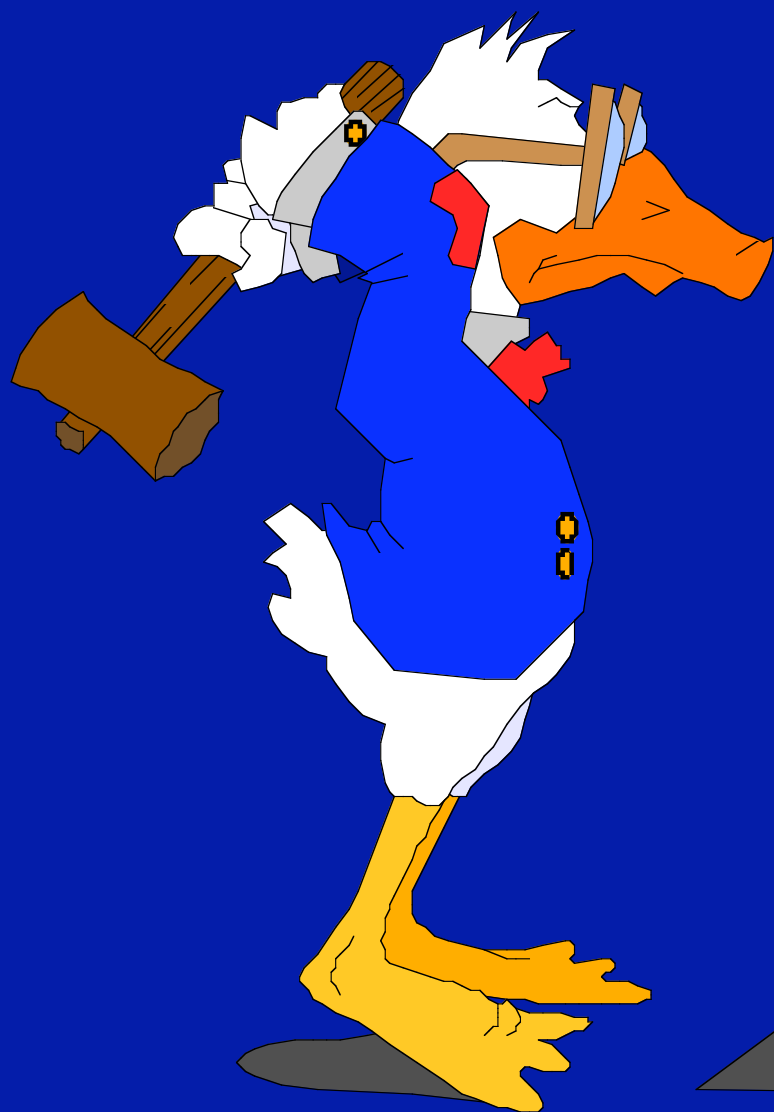
- Forage comprised 40 to 55% of the diet for lactating cows.
- Forage portion was ~30% alfalfa and ~70% corn silage
- Forage fed in a TMR with corn grain, roasted soybeans, soybean meal, and fat
- Cows injected with BST





## **Modeling assumptions**

- Initial cost of macerator is 2 times higher than disk mower-conditioner
- Power requirement of macerator is 1.5 times higher than disk mower-conditioner
- Ground speed of macerator is 40% less than disk mower-conditioner
- Maceration doubles the drying rate of alfalfa
- Maceration increases alfalfa net energy of lactation by ~10%.
- Maceration increases packed forage density by 30%
- Maceration increases losses during rain by 6-fold





# Alfalfa production (tons dry matter)

	Hay	Silage	Silage impact
• Conditioned alfalfa 610 (41%)*		688	+ 78
• Macerated alfalfa 714 (60%)		726	+ 12
Maceration impact	+ 104	+ 38	

\* % of high quality (<42% NDF) hay

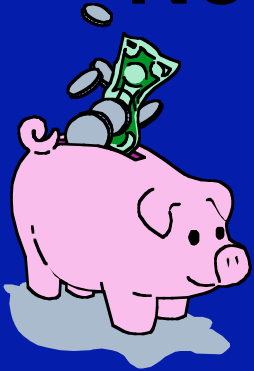
# Milk production (lb per cow)



	Hay	Silage	Silage impact
• Conditioned alfalfa	27,600	27,700	+ 100
• Macerated alfalfa	27,900	28,000	+ 100
Maceration impact	+ 300	+ 300	



# Net return to management (\$ per cow)



	Hay	Silage	Silage impact
• Conditioned alfalfa	437	497	+ 60
• Macerated alfalfa	507	517	+ 10
Maceration impact*	+ 70	+ 20	

\* Maceration reduced costs for hay, purchased corn grain, manure hauling and increased milk production

# Research Questions

- Does maceration influence protein degradation in the silo and rumen?
- Can maceration conserve starch and sugars accumulated in P.M. harvested alfalfa?
- Can effective macerators be built at lower cost and with lower power requirements?
- Can macerated alfalfa be fed more effectively in dairy rations?